REMARKS

Applicants have studied the Office Action dated February 10, 2005, and have made amendments to the claims. Claim 6 has been canceled without prejudice. Claims 1, 2 and 12 have been amended. Claims 15-20 have been allowed. No new matter has been added. It is submitted that the application, as amended, is in condition for allowance. Reconsideration is respectfully requested.

Rejection under 35 U.S.C. § 103

Claims 1 and 6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,650,707 to Youn et al. (Youn et al.) in view of U.S. Patent No. 6,389,171 to Washington (Washington).

By this paper, claim 6 has been canceled without prejudice. Therefore, the rejection with regard to claim 6 is now moot.

With regard to claim 1, the rejection is respectfully traversed. The present invention of claim 1 relates to a variable length decoding method of a bit stream variable length coded (VLC) to a digital camcorder format. However, Youn et al. relates to an IDCT method of a bit stream that is DCT, quantized, and variable length coded (VLC) to a general MPEG format and then transmitted. Particularly, the variable length decoder is placed at the fore-end of the IDCT within the video decoder. Also, dequantization and IDCT can be performed only after the variable length decoding is completed.

Moreover, the object of the present invention is to reduce the memory size when performing the variable length decoding. However, the object of Youn et al. is to simplify the IDCT calculation.

In the digital camcorder format, one video segment comprises five (5) macro blocks (MB0 ~ MB4). And, each macro block comprises six (6) DCT blocks. In other words, thirty (30) DCT blocks configure one video segment.

Considering the characteristics of the camcorder, a trick-mode playback function is important. Therefore, in order to perform high-speed forward playback and reverse playback, a DC coefficient for each block is recorded on a fixed position, when performing variable length coding. The AC coefficients are sequentially recorded on the space remaining after the DC coefficients are recorded.

In order to do so, each DCT block allocates a basic area (14 bits for brightness, 10 bits for color) for the AC coefficients. Then, a bit stream obtained by a compressed encoding of

each DCT block is sequentially recorded on the basic area allocated in each DCT block. At this point, the size of the bit stream may either be larger or smaller than the basic area. If the bit stream is smaller than the basic area, the entire bit stream is recorded on the basic area, thereby creating an EOB in the DCT block. However, if the bit stream is larger than the basic area, the entire bit stream cannot be recorded on the basic area of the corresponding DCT block. Therefore, the non-recorded portion of the bit stream is recorded on a remaining area of another DCT block, wherein DCT is already completed. In this case, the EOB is not created in the corresponding DCT block. The above-described process is repeated until the surplus area or remaining area of the entire video segment is completely used (or occupied).

This characteristic is only related to the digital camcorder format and is different from the MPEG format of Youn et al., which is applied to a transcoder.

In the transcoder of Youn et al., the DC coefficients and AC coefficients for each DCT block are recorded sequentially during the variable length coding, instead of being recorded separately. Herein, the EOB is created at the end of the corresponding DCT block.

As described above, the variable coding method of the present invention and that of Youn et al. are different from one another. Therefore, the variable length decoding methods of each invention are also different from one another.

Particularly, the present invention is related to variable length decoding. However, since Youn et al. is not related to variable length decoding, the structures of the two inventions cannot be the same.

Furthermore, the present invention and Youn et al. each apply EOB detection and the detected EOB in a different field. The present invention detects whether the EOB of each DCT block that is variable length coded to a DV format is created in the basic area allocated to the corresponding DCT block, or whether the EOB is created in the remaining area of another DCT block. Then, variable length decoding is performed in accordance with the detected result.

In order to simplify the description of the present invention, the DCT block having the EOB created in the basic area allocated to the corresponding DCT block is referred to as a "complete DCT block". In the opposite case, the DCT block is referred to as an "incomplete DCT block". When the EOB is created in the basic area allocated to each of the six (6) DCT blocks of a macro block, the corresponding macro block is referred to as a "complete macro block". In the opposite case, the macro block is referred to as an "incomplete macro block".

Furthermore, a macro block index vector and a DCT block index vector respectively indicate whether each of the macro blocks and the DCT blocks is complete or incomplete. Based upon the contents of the macro block index vector and the DCT block index vector, the

variable length decoding is performed within a corresponding video segment in the order of a complete DCT block within a complete macro block, an incomplete DCT block within a complete macro block, a complete DCT block within an incomplete macro block, and an incomplete DCT block within an incomplete macro block. The above-described characteristic is recited in amended claim 1.

Youn et al. relates to detecting an EOB position within a DCT block that is variable length decoded to an MPEG format and performing dequantization and IDCT in accordance with the detected result. Specifically, Youn et al. does not teach or suggest the concept of a basic area, remaining area, and surplus area for the DCT blocks and macro blocks. Therefore, the concepts of the "complete DCT block", "incomplete DCT block", "complete macro block", and "incomplete macro block", as recited in amended claim 1, are not taught in Youn et al.

Furthermore, since the DCT block is formed in an 8x8 unit size, a total of 64 areas exist in each DCT block. At this point, by using a zigzag scanning method, among the DCT coefficients, DC coefficients are included in the first area of the corresponding DCT block. AC coefficients exist in the remaining area. The last DCE coefficient other than "0" becomes the EOB position of the DCT block.

For example, when the EOB of a random DCT block is equal to "0", then all DCT coefficients of the corresponding DCT block are also equal to "0". When the EOB is equal to "1", this indicates that the EOB is detected in the first area, wherein the DC coefficient is included. Similarly, when the EOB is equal to "2" or "3", this indicates that the EOB is detected in the second or third area defined by the zigzag scanning method.

Therefore, Youn et al. performs dequantization and IDCT differently depending upon the detected position of the EOB. In Youn et al., if the EOB position is lower than "10", then dequantization and IDCT are performed by the reduced number of coefficients. Alternatively, if the EOB position is greater than "10", then dequantization and IDCT are performed by all of the DCT coefficients.

By determining the DCT block and the macro block to be complete or not, based upon whether the EOB is detected in the basic area, and by performing the variable length decoding in the order of a complete DCT block within a complete macro block, an incomplete DCT block within a complete macro block, a complete DCT block within an incomplete macro block, and an incomplete DCT block within an incomplete macro block, the present invention can reduce the memory size required for performing variable length decoding.

Depending upon the EOB position within each DCT block, by performing dequantization and IDCT either by the reduced number of DCT coefficients or by all DCT coefficients, Youn et al. can simplify the IDCT calculation.

In other words, since Youn et al. is not related to variable length decoding, Youn et al. cannot reduce the memory size as described in the present invention.

In view of the above, Applicants respectfully submit that the Youn et al. and Washington references, either alone or in combination, do not teach or suggest the invention of claim 1. Accordingly, Applicants respectfully request that claim 1 and the claims dependent therefrom (claims 2-5 and 7-14) be allowed over the prior art.

CONCLUSION

In light of the above remarks, Applicants submit that the present Amendment places all claims of the present application in condition for allowance. Reconsideration of the application, as amended, is requested.

No amendment made was related to the statutory requirements of patentability unless expressly stated herein; and no amendment made was for the purpose of narrowing the scope of any claim, unless Applicant has argued herein that such amendment was made to distinguish over a particular reference or combination of references.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California, telephone number (213) 623-2221 to discuss the steps necessary for placing the application in condition for allowance.

Respectfully submitted,

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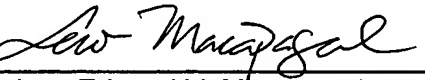
By: 

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